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(56) Documents Cited
GB 2331588 A
GB 2323487 A
GB 2268341 A
GB 2226197 A
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(71) Applicant(s)
Paul Brown
4 Brownlow Road, BOREHAMWOOD,
Herts, WD6 2DE, United Kingdom

(72) Inventor(s)
Paul Brown

(74) Agent and/or Address for Service
Saunders & Dolleymore
9 Rickmansworth Road, WATFORD, Herts,
WD18 0JU, United Kingdom

(54) Abstract Title
Fuse status indicator employing at least one LED

(57) The circuit breakage indicator includes a diode 2 and LED 4 and resistor 6 forming a first circuit positioned upstream of fuse 3. A diode 5 connected in series with fuse 3 forms a second circuit to bypass the current path through LED 4 while fuse 3 is intact, thereby inhibiting illumination of LED 4. When the fuse 3 blows, the full current flows through LED 4 causing it to be illuminated. Alternatively a second LED 10 may be provided to indicate that the fuse is intact. The two LEDs 4 and 10 may be of different colour, e.g. red and green respectively, to clearly distinguish the status of the fuse. However, the two LEDs may be substituted for a two colour LED which emits one colour associated with the status of the fuse.

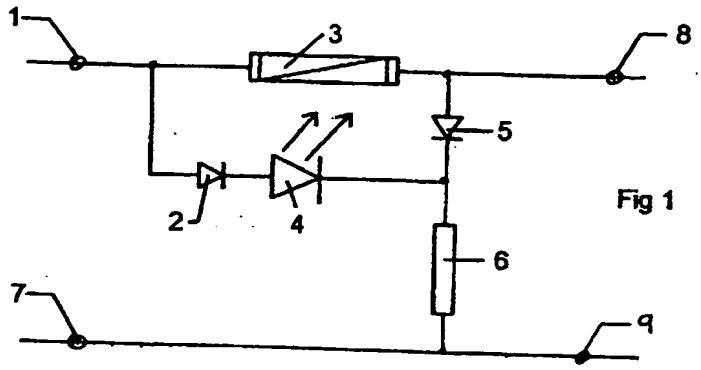

Fig 1

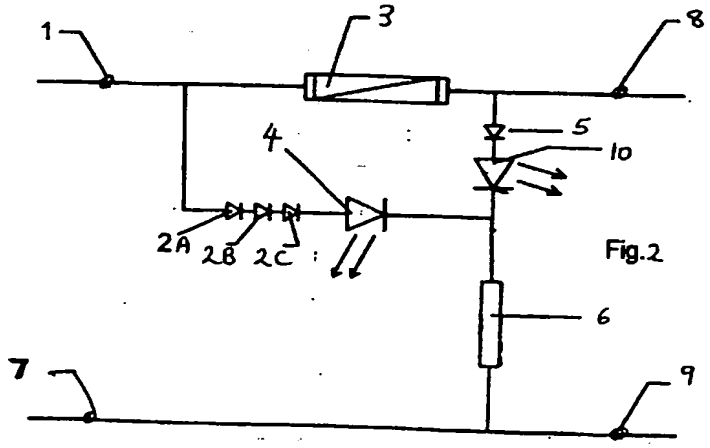

Fig.2

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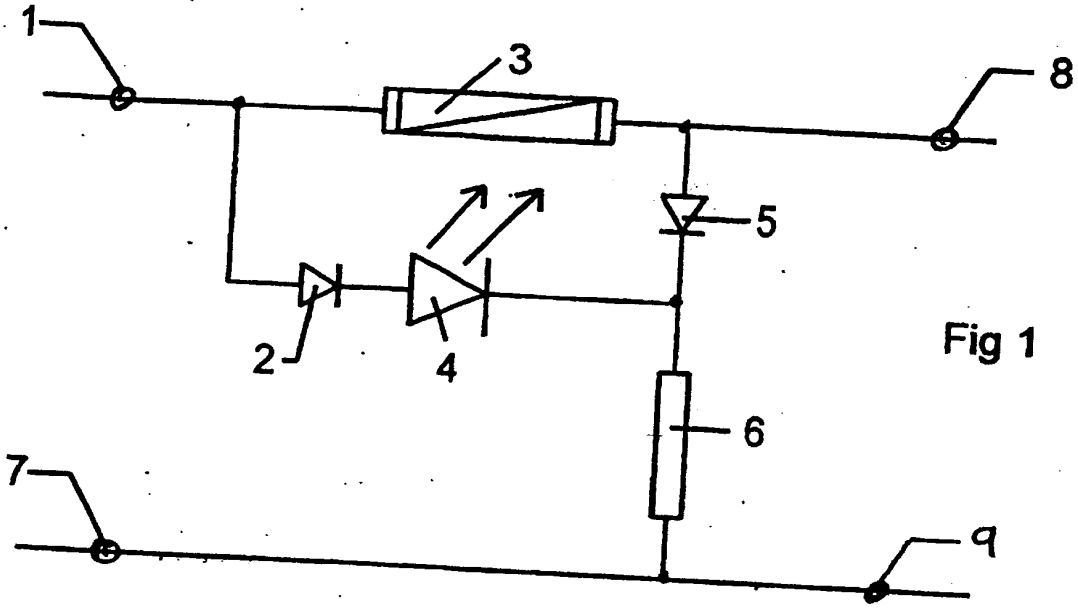

Fig 1

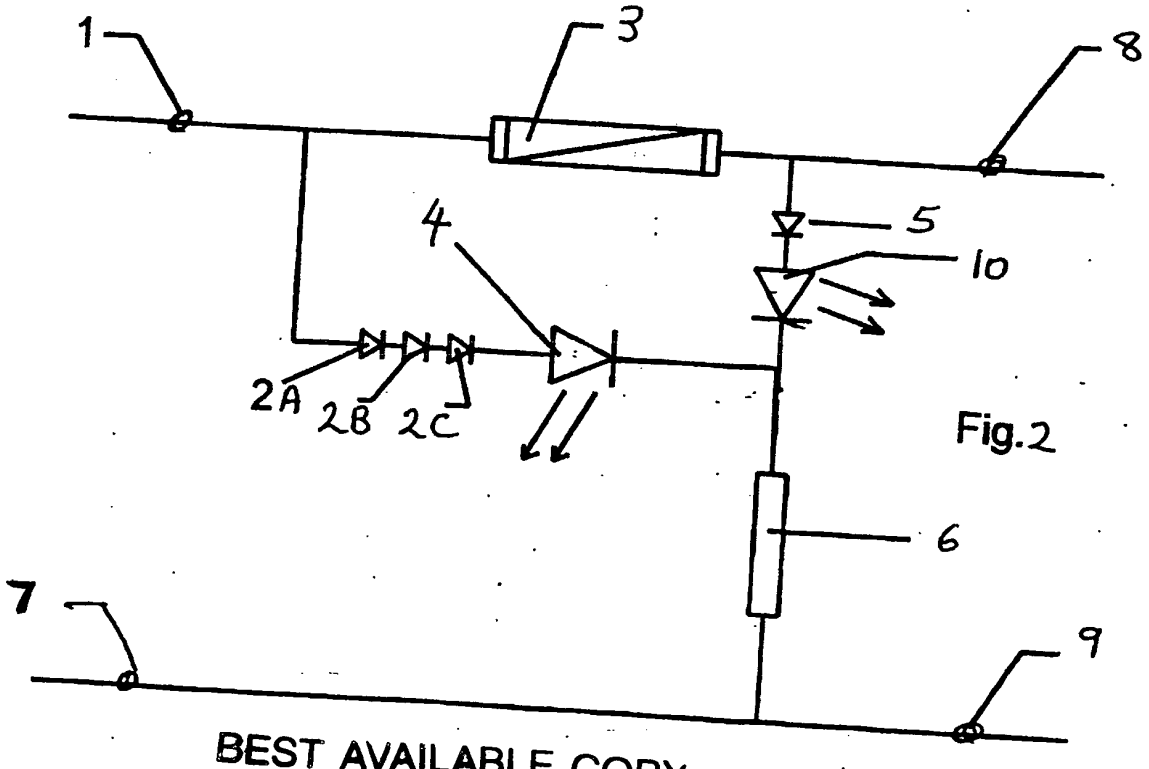

Fig.2

CIRCUIT BREAKAGE INDICATORS

The present invention relates to circuit breakage indicators.

Local power distribution systems employ fuse boxes in which different circuits are provided with an individual fuse or current overload tripped circuit breaker. Both will hereinafter be referred to as a fuse.

Where the power distribution system has a plurality of fuses there are sometimes provided indicators which become illuminated when a fuse blows. Such indicators take the form of a neon bulb and a series resistor connected in parallel with the fuse. Provided the load remains in circuit, a current will flow through the neon bulb when the fuse blows and its illumination will indicate the fuse which has blown.

Neon bulbs, however, are not particularly reliable, have a short life, and come in a limited range of colours. Although such neon bulbs could be replaced by LED's the problem is that LED's need to draw a much higher current and so the leakage current flowing through the LED and load following the failure of a fuse would be unacceptably high and not meet the required safety standards.

It is an object of the invention to provide an improved circuit breakage indicator.

According to the present invention there is provided a circuit breakage indicator comprising a first circuit connectable across a power supply upstream of a fuse and including an indicator unit capable of drawing sufficient current from said supply to provide a predetermined indication, a second circuit connectable across said power supply downstream of said fuse and operable when energised to suppress the current drawn by said indicator to a level sufficient to extinguish said

predetermined indication.

Circuit breakage indicators embodying the invention will now be described, with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a circuit diagram of a first embodiment of a circuit breakage indicator; and

Figure 2 is a circuit diagram of a second embodiment of a circuit breakage indicator.

As shown in Figure 1, AC power is supplied to a pair of input terminals 1 and 7 and a load (not shown) is connected across a pair of output terminals 8 and 9. One input terminal 1 is connected to one output terminal 8 via a fuse 3. The other input terminal 7 is directly connected to the other output terminal 9. The series combination of a diode 2, a light emitting diode (LED) 4 and a resistor 6 are connected across the input terminals 1 and 7. Normally current would flow through this circuit so that the LED 4 would light up. However, a diode 5 is connected between the terminal 8 and the junction between the LED 4 and the resistor 6. Thus when the fuse 3 conducts or is intact the diode 5 acts as a shunt to the series combination of the diode 2 and the LED 4 and so prevents the LED 4 from drawing enough current from it to provide a light output.

When the fuse 3 opens the circuit, or blows, the diode 5 is no longer in circuit and so the potential across the series combination of the diode 2 and the LED 4 rises to a sufficient level to cause the LED to light up.

Thus, as can be seen, the LED indicates when the fuse 3 has opened circuit or ruptured.

Instead of the resistor 6 any other form of impedance or complex impedance circuit including for example a capacitor can be used.

In the embodiment shown in Figure 2 parts similar to those in Figure 1 are similarly referenced.

As can be seen the diode 2 is replaced by three diodes 2A, 2B and 2C connected in series and a second LED 10 is connected in series with the diode 5 to form the shunt across the series circuit of the diodes 2A, 2B and 2C and the LED 4.

In operation, while the fuse 3 remains intact, current flows through the series circuit of the diode 5, the LED 10 and the resistor 6, to cause the LED 10 to illuminate. Meanwhile, little or no current flows through the series circuit of the diodes 2A, 2B, 2C and the LED 4 and so the LED 4 is extinguished. When the fuse 3 opens circuit, current can no longer flow through the LED 10 and so it becomes extinguished. Instead current flows through the LED 4 so that the LED 4 becomes illuminated. The LED's 4 and 10 preferably emit different colours, for example red and green, respectively. Thus the green light will indicate that there is power at terminals 8 and 9 while the red light will indicate that the fuse has open circuited.

As can be appreciated, instead of the diode 5 providing a shunt to the LED 4, other monitoring means may be provided to monitor the existence of a potential at terminal 8 to enable or disable the LED 4. For example, a switching transistor may be connected in series or in parallel with the LED 4, which transistor is switched by the potential at terminal 8.

The LED's 4 and 10 may comprise a single tricolour LED with one anode being fed from the diode 5 and the other anode being fed from the diodes 2A to 2C.

In a modification of the circuit shown in Figure 1 the LED 4 may comprise

a two colour output LED emitting light of a first colour when the current drawn exceeds a predetermined threshold, and emitting light of a second colour when the current drawn is below the predetermined threshold. In this event the shunting effect produced by the diode 5 when the fuse is intact is modified so as to allow a minimum current to flow through the LED 4 to sustain the emission of light of said second colour.

It will be appreciated that the function of the LED as an indicator unit can be performed by other components, for example piezo device or an electroluminescent lamp. A photomos relay or opto-isolator could also be used to switch, for example, an indicator or other alarm to make available an alarm indication at a remote location.

CLAIMS

1. A circuit breakage indicator comprising a first circuit connectable across a power supply upstream of a fuse and including an indicator unit capable of drawing sufficient current from said supply to provide a predetermined indication, a second circuit connectable across said power supply downstream of said fuse and operable when energised to suppress the current drawn by said indicator to a level sufficient to extinguish said predetermined indication.

2. An indicator according to Claim 1, wherein said first and second circuits share a common impedance means which draws current from the power supply whether or not the fuse is open circuit or not.

3. An indicator according to Claim 1 or to Claim 2, wherein said first circuit includes the series combination of a diode, a light emitting diode and a resistor.

4. An indicator according to Claim 3, wherein said second circuit includes the series combination of a diode and said resistor.

5. An indicator according to Claim 3, wherein said second circuit includes the series combination of a diode and a second light emitting diode whereby only said first mentioned light emitting diode emits light when said fuse is open circuit and only said second light emitting diode emits light when said fuse is not open circuit.

6. An indicator according to Claim 5, wherein said light emitting diodes emit light of different colours.

7. An indicator according to Claim 6, wherein said first mentioned light emitting diode emits red light when energised and said second light emitting diode

emits green light when energised.

8. An indicator according to any one of Claims 1 to 4, wherein said light emitting diode emits light of a first colour when energised by a current exceeding a predetermined threshold and emits light of a second colour when the current drawn falls below said predetermined threshold, said predetermined indication comprising the emission of light of said first colour.

9. An indicator according to any preceding claim, wherein the fuse comprises a current overload trip circuit breaker.

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Application No: GB 0126340.9 **Examiner:** Mark Gainey
Claims searched: 1 to 9 **Date of search:** 15 July 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): H2G(GDD), H2K(KDX)

Int Cl (Ed.7): G01R(31/02), G08B(21/00), H02H(3/04)

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	GB 2331588 A	JONES see abstract, figure 3 and p.3 l. 29 - p.4 l.11	5,6,7
A	GB 2323487 A	CARE-SLADE figures 1 - 3 and p. 2 l.19 - p. 3 l. 8	-
A	GB 2268341 A	DHANANI see figure 1 and 2	-
A	GB 2226197 A	VEB KOMBINAT MEDIZIN und LABORTECHNIK LEIPZIG see figure 1 and p.5 ll. 6 - 21	-
X	EP 0588529 A2	AMERICAN TELEPHONE AND TELEGRAPH COMPANY see whole document	1,8,9
X,Y	US 4691197	DAMIANO et al. see figures 1 & 2, col. 1 ll.50 -61 and col.3 ll. 16 - 42	X:1,2,3,4, 8,9 Y:5,6,7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.